

Part 3– Wheel & Axle

Effort force on Wheel

1. Label the drawing of the Wheel & Axle
(Wheel, Axle, F_E , F_R , D_E , D_R)
when your effort force is applied to the WHEEL.



2. Measure the diameter of the WHEEL and record it here: _____
3. Measure the diameter of the AXLE and record it here: _____
4. Calculate the ideal mechanical advantage of the Wheel & Axle system when your effort force is applied to the WHEEL.
5. Record your known resistance force here: $F_R =$ _____ (see Part 0)
6. Predict (by calculating it) the amount of effort force you would need to use in “ideal conditions” in order to overcome the known resistance force when your effort force is applied to the WHEEL. (hint: Use $AMA = IMA$)

$$F_{E_{predicted}} = \underline{\hspace{2cm}}$$

7. Use a force sensor to measure the actual effort force required when your effort force is applied to WHEEL and record it here:

$$F_{E_{actual}} = \underline{\hspace{2cm}}$$

8. Calculate the actual mechanical advantage of the Wheel & Axle system when your effort force is applied to WHEEL.
9. Calculate the efficiency of the Wheel & Axle system when your effort force is applied to WHEEL.

Please explain why you think your wheel and axle system has the efficiency you just calculated.

Effort force on Axle

1. Label the drawing of the Wheel & Axle (Wheel, Axle, F_E , F_R , D_E , D_R) when your effort force is applied to the AXLE.



2. Record the diameter of the WHEEL here (you already measured it): _____
3. Record the diameter of the AXLE record (you already measured it): _____
4. Calculate the ideal mechanical advantage of the Wheel & Axle system when your effort force is applied to the AXLE.
5. Record your known resistance force here: $F_R =$ _____ (see Part 0)
6. Predict (by calculating it) the amount of effort force you would need to use in “ideal conditions” in order to overcome the known resistance force when your effort force is applied to the AXLE. (hint: Use $AMA = IMA$)

$$F_{E_{predicted}} = \underline{\hspace{2cm}}$$

7. Use a force sensor to measure the actual effort force required when your effort force is applied to AXLE and record it here:

$$F_{E_{actual}} = \underline{\hspace{2cm}}$$

8. Calculate the actual mechanical advantage of the Wheel & Axle system when the effort force is applied to the AXLE.
9. Calculate the efficiency of the Wheel & Axle system when the effort force is applied to the AXLE.

Please explain why you think your wheel and axle system has the efficiency you just calculated.